

Index

Reactor Fuel Processing

Volume 9

Note: The page range for each of the four issues of Vol. 9 is as follows: No. 1, pages 1 to 64; No. 2, pages 65 to 135; No. 3, pages 137 to 183; and No. 4, pages 185 to 242.

- A**
- Actinides
recovery from nuclear detonations in salt, 151-52
- AEC
reevaluation of fuel-processing technology, 185
- AIROX process, 103
economics, 36
processing of UO_2 by, 36
- Alamina 336-LiCl extraction process
transplutonic element recovery by, 150-51
- ALKEM
(see Alpha-Chemie und Metallurgie G.m.b.H.)
- Allied Chemical Corp.
production of UF_6 , 65
- Alpha-Chemie und Metallurgie G.m.b.H.
 PuO_2 fabrication for Euratom, 1
- Alumina (calcined)
heat dissipation from, 115
heat generation in, 119
leaching of fission products from, 114-15
- Aluminum alloys (Al-U)
chloride-volatility processing, 24-25
fluoride-volatility processing, 202-3
molten-salt fluoride-volatility processing, 93-95
- Aluminum-powder metallurgy
[see SAP (sintered aluminum products)]
- Americium
production and separation, 19-21
- Americium-241
recovery by the Alamine 336-LiCl extraction process, 150-51
value in spent power-reactor fuels, 3
- Americium-243
recovery by the Alamine 336-LiCl extraction process, 150-51
value in spent power-reactor fuels, 3
- Amines
use in solvent extraction, 73-74
use in solvent extraction, radiation effects, 197
- Anion-exchange resins
exothermic reactions in HNO_3 systems, 131-34
- Aqueous processing, 16-22, 69-82, 147-55, 194-200
- Argonne National Laboratory
LMFBR program office established, 187
spinoff program, 187
- Arsenic fluorides (AsF_3)
enthalpy of formation, 93
- Asphalt
incorporation of nuclear wastes in, 111-12, 170-71, 227
- B**
- Beryllium fluorides (BeF_2 -LiF)
chemistry of molten, 97
- Booklets
review of nuclear industry, 2
- USAEC—What It Is, What It Does, 2
- C**
- Calcination
waste-disposal applications, 42-44, 112-15, 119, 171-73, 227-34
- California Nuclear Inc., Lafayette, Ind.
burial of waste at Hanford, licensing proposal, 2
operation of low-level-waste burial site in Ill., 65
- CARBOX process
economics, 38
processing of UC by, 36-37
- Cerium
recovery from waste solutions by solvent extraction, 117-18, 173-74
- Cerium-144
price decrease, 65
production by FPCE, 65
value in spent power-reactor fuels, 3
- Cerium fluorides (CeF_3)
preparation of pure anhydrous, 92-93
- Cesium
recovery from Darex wastes by solvent extraction, 118
recovery from TBP-25 process wastes by solvent extraction, 118
recovery from wastes by ion exchange, 234
recovery from wastes by solvent extraction, 117
removal from wastes by ion exchange, 170, 225-26
- Cesium-137
encapsulation plant, plans for, 186
- price decrease, 65
production by FPCE, 65
recovery from Purex wastes by precipitation, 48-49
recovery from Purex wastes by solvent extraction, 48
recovery from Redox wastes by ion exchange, 47-48
removal from fuel-storage-basin water by ion exchange, 40-41
value in spent power-reactor fuels, 3
- Chloride-volatility processes, 24-25, 86
- Chlorine fluorides (ClF_3)
reaction with H_2O , 161
- Chlorine fluorides (ClF_3)
preparation and properties, 161
- Chromatography
separation of Th and U from fission products by, 198
- Cobalt
removal from wastes by ion exchange, 225-26
- Columns (pulse)
flooding equations, 199-200
- Commercial aspects of fuel processing, 1-15, 65-68, 137-45, 185-93
- Commercial facilities
close-coupled, design, 9-10
close-coupled, economic evaluation, 7-10
- Dounreay Plant, 1
- Eurochem processing plant, 1, 137
153-55
Nuclear Fuels Services, startup, 185
French, startup of new, 185
proposal by Allied Chemical, 65
proposal by General Electric, 65
- Computers
use in inventory and control of stored wastes at Savannah River, 118
- Conferences and symposia
commercial Pu fuel, 138-39, 189-91
solidification and long-term storage of nuclear wastes, 171-73
spent-fuel shipping, 13
- Continental Mining and Milling Company
sale of U_3O_8 to AEC, 138
- Copper
reaction with F_2 , 32
- Copper oxide (CuO)
reaction with F_2 , 31-32
- Copper oxide (Cu_2O)
reaction with F_2 , 31-32
- Crystallization
waste treatment by, 118-19

- Curium-242
 - recovery by the Alamine 336-LiCl extraction process, 150-51
 - value in spent power-reactor fuels, 3
- Curium-244
 - production and separation, 19-21
 - recovery by the Alamine 336-LiCl extraction process, 150-51
 - use as heat sources, 3
 - value in spent power-reactor fuels, 3

D

- Darex wastes
 - recovery of Cs and Sr from, 117-18
- Decladding
 - (see also Fuel elements)
 - chemical means, 25-27, 70, 75-78, 195-96, 206-7
- Dissolution
 - (see also specific materials dissolved)
 - of APPR fuel by ICPP electrolytic, 22
 - of HTRE fuel by ICPP electrolytic, 22
- Dissolver solution
 - boiling-point determination, device for continuous, 82
- Dissolvers
 - ICPP electrolytic, design and operation, 21-22, 75-78, 147-49
- Dounreay Plant
 - processing of spent fuel from French reactors, 1

E

- EBR-II Fuel Cycle Facility
 - operation, 32-33, 219-20
 - remote systems in, 106
- EBR-II skull-reclamation process, 33-34, 103-4, 166, 220-21
- Economics
 - AIROX process, 36
 - CARBOX process, 38
 - close-coupled fuel processing, 7-10
 - converter-reactor fuels, 3-4
 - enrichment of U, 188-89
 - evaluation of $\text{PuO}_2\text{-UO}_2$ fuels, 67
 - fission-product recovery from spent power-reactor fuels, 2-3
 - fuel cycles, 66-68, 187-93
 - fuel cycles, comparison of aqueous, volatility and pyrochemical processing methods, 140-43
 - fuel cycles, effects of burnup, 67
 - heavy-element recovery from spent power-reactor fuels, 2-3
 - plutonium fuel cycle, 143-45, 187, 189-91
 - perpetual high-level-waste storage, 44-46
 - spent-fuel shipping, 10-13
 - waste storage, 44-46, 143
- Electrodeionization
 - waste-disposal applications, 170-71, 226-27
- Electrodialysis
 - waste-disposal applications, 170-71, 226-27
- Electrolytic dissolvers
 - (see Dissolvers)
- Electrolytic processes
 - production of high-purity Pu, 57, 167
 - reduction of UO_2 to U metal, 55-56
- Equipment
 - contactor for conversion of PuO_2 to PuF_4 , 241

- corrosion testing in the salt-transport process, 219-22
- design for fluoride-volatility processes, 211
- design of primary reactor for fluoride-volatility pilot plant, 89-90
- hydrolyzer for PuF_4 , 30
- ICPP electrolytic dissolver, design and operation, 75-78
- mixer-settler operation in dilute Thorex process, 198-99
- pulse columns, flooding equations, 199-200
- sampling system for Eurochemic, 153-55
- Euratom
 - plutonium purchase from AEC, 1
- Eurochemic processing plant
 - design and operation, 137
 - fuel processing for the BR-3, EDF-1, EL-1, EL-2, and EL-3 reactors, 1
 - remote sampling system for process streams, 153-54
- Evaporation
 - application to waste processing and disposal, 118, 234
- Evaporators
 - design of solar for nuclear wastes, 234

F

- Federal Electric Corp., Paramus, N. J.
 - support services for Hanford, 2
- Feed materials
 - processing, review, 68
- Filtration
 - of hydrolyzed PuF_4 , factors affecting, 29-30
- Fires
 - hazards of anion-exchange resins in nitric acid systems, 131-34
- Fission Product Conversion and Encapsulation Plant
 - operation by Isochem, Inc., 1-2, 65, 186
- Fission products
 - (see also specific fission products)
 - encapsulation plant, plans for, 65, 186
 - leaching from calcined alumina, 114-15
 - recovery from spent power-reactor fuels, economics of, 2-3
 - recovery from nuclear wastes, 1-2, 46-49, 117-18, 173-74, 234
 - values in spent power-reactor fuels, 2-3
- Fissionable material
 - accountability, amendments to regulations on, 186-87
 - value in spent power-reactor fuels, 3
- Flow sheets
 - curium-244 production by Pu irradiation, 20
 - dissolution and first-cycle solvent extraction of U-Zr alloys in ICPP process, 148
 - fluoride-volatility processing of Molten-Salt Thermal Breeder Reactor fuel, 162
 - fuel cycle for HTGR, 195
 - ICPP electrolytic dissolution process, 76
 - incorporation of wastes in asphalt, 112
 - ion-exchange purification of ^{147}Pm at PNL, 47
 - ion-exchange treatment of Harwell-plant intermediate wastes, 42
 - mixed carbide fuel-cycle alternates, 60
 - molten-salt fluoride-volatility process, 94
 - MSBR fuel processing by fluoride-volatility and salt-distillation techniques, 214

- ORNL pot processes for waste
 - fixation, 228
- plutonium separation from fuel solutions by amine system, 19
- recovery of actinides produced by nuclear explosions in crude salt, 152
- recovery of ^{237}Np at ICPP, 150
- sol-gel process, 123
- uranium hexafluoride conversion to U_3O_8 , 53
- uranium hexafluoride conversion to UO_2 , 53
- uranium hexafluoride decontamination, 91
- waste disposal in fluoride-volatility processing of Zircaloy-2-clad UO_2 , 212
- water-recycle process, 110-11
- Fluoride-volatility processes, 24-32, 84-97, 157-64, 202-16
 - (see also specific materials processed by)
 - evaluation by AEC, 185
 - remote systems in, 106
 - waste disposal, 211-12
- Fluorine
 - reaction with Cu, 32
 - reaction with Cu_2O and CuO , 31-32
 - reaction with graphite, 31
- Food
 - irradiation plant, proposal by Vitro Engineering Co., 65
- FPCE
 - (see Fission Product Conversion and Encapsulation Plant)
- France
 - spent-fuel processing by Dounreay Plant, 1
 - spent-fuel processing by Eurochemic, 1
 - startup of new fuel-processing plant, 185
- Freeze-drying process
 - waste-disposal applications, 42
- Fuel cycles
 - economic comparison of aqueous, volatility, and pyrochemical processing methods, 140-43
 - economics, 66-68, 187-93
 - economics, effects of fabrication methods, 67-68
 - economics, effects of fuel burnup, 67
 - economics of Pu, 143-45, 187, 189-91
 - economics of $\text{PuO}_2\text{-UO}_2$, 67
 - economics of (U, Pu)C, 59-60
- Fuel elements (graphite-U-impregnated)
 - dissolution methods, 16-17
- Fuel elements (irradiated)
 - shipping, economics, 10-13
 - shipping, symposium, 13
- Fuel elements (stainless-steel clad)
 - decladding by electrolytic dissolution, 75-78
- Fuel elements (PuC)
 - dissolution methods, 16-17
- Fuel elements ($\text{PuO}_2\text{-UO}_2$)(stainless-steel clad)
 - decladding with H_2SO_4 , 70
- Fuel elements (ThC)
 - dissolution methods, 16-17
- Fuel elements (U-Al alloy)
 - dissolution by the Nitrofluor process, 202
 - processing by molten-salt fluoride-volatility processes, 93-97
- Fuel elements (UC)
 - dissolution methods, 16-17
- Fuel elements (UO_2)
 - Pu recovery from irradiated by fluid-bed fluoride volatility, 27-28

Fuel elements (UO_2)(stainless-steel clad)
 decladding by HF-O_2 in fluid bed of
 Al_2O_3 particles, 25-27, 206-7
 dissolution by the Nitrofluor process, 202
 Fuel elements (UO_2)(Zircaloy clad)
 decladding with $\text{NH}_4\text{F-citric acid}$, 195-96
 decladding by HF-O_2 in fluid bed of
 Al_2O_3 particles, 206-7
 Fuel elements (UO_2)(Zircaloy-2 clad)
 decladding by HF-O_2 in fluid bed of
 Al_2O_3 particles, 25-27, 206-7
 decladding by oxidation of UO_2 to U_3O_8
 powder, 25-26
 Fuel elements (UO_2)(zirconium clad)
 decladding with $\text{NH}_4\text{F-citric acid}$, 195-96
 Fuel elements (U_3O_8)(Al clad)
 dissolution in Hg catalyzed H_2SO_4 , 16
 Fuel elements (U-Zr)(Zircaloy clad)
 dissolution in HF in the ICPP dissolver,
 147-49
 Fuels
 (see also specific materials used as
 fuels)
 fabrication, review, 68
 processing of graphite-matrix, 69-70
 processing technology, reexamination
 by AEC, 185
 shipping of spent, economics, 10-13
 Fused-salt electrolysis process, 104

G

Gallium alloys (Ga-Pu)
 electrorefining for high-purity Pu prepa-
 ration, 57
 Gas-centrifuge experiments
 license issued to General Electric Co.,
 65
 General Electric Co.
 gas-centrifuge experiments, license is-
 sued for, 65
 Germany
 nuclear power development, 191-92
 Glasses
 incorporation of nuclear wastes in, 43-44,
 73, 113-15, 172-73, 175, 228-33
 Graphite
 reaction with F_2 , 31
 recovery of Pu from molds, 128
 Graphite systems (UC-graphite)
 processing by burning, leaching, and sol-
 vent extraction, 196
 Ground
 disposal of wastes in, 175

H

Hanford Works
 availability of support facilities to indus-
 try for in-place use, 186
 solid-waste burial, 2
 support services, contract negotiation, 2
 Harwell-plant waste
 ion-exchange treatment of intermediate,
 41-42
 Heat sources
 fission products, value in spent power-
 reactor fuels, 2-3
 Hydraulic fracturing
 waste disposal into shale by, 116-17

I

Idaho Chemical Processing Plant
 electrolytic dissolver, design and opera-
 tion, 21-22, 75-78, 147-49

ion-exchange treatment of fuel-storage-
 basin water, 40-41
 Idaho Nuclear Corporation
 selected as operator of NRTS, 186
 Incinerator
 design for solid wastes, 234-35
 Indemnification
 nuclear power plant operators, amend-
 ments to, 139
 Industry
 availability of Hanford support facili-
 ties for in-place use, 186
 availability of Weldon Spring Plant to,
 186
 review of nuclear, 2, 68
 spinoff program at ANL, 187
 Information centers
 establishment of liquid metals at Canoga
 Park, California, 187
 establishment of rare-earth at Ames Lab-
 oratory, 139-40
 Instruments
 for continuous measurement of dissolver-
 solution boiling point, 82
 Insurance
 (see Indemnification)
 International Atomic Energy Agency
 review of Pu use in power reactors, 187
 Ion-exchange processes, 74-75, 153
 (see also specific element separated
 by)
 waste-disposal applications, 40-42, 47-
 48, 110-11, 170, 225-26, 234
 Ion-exchange resins
 disposal of spent radioactive at Shipping-
 port, 118
 exothermic reactions in HNO_3 systems,
 131-34
 Iron alloys (Fe-Pu)
 electrorefining for high-purity-Pu prepa-
 ration, 57
 Isochem, Inc.
 operation of FPCE, 65, 186

K

Krypton-85
 value in spent power-reactor fuels, 3

L

Leaching
 fission products from calcined alumina,
 114-15
 plutonium from graphite molds, 128
 uranium from ores, 51-52
 Licensing
 commercial burial of solid waste at Han-
 ford, 2
 FPCE, 1-2
 Liquid Metals Information Center
 establishment at Canoga Park, California,
 187
 Lithium fluorides ($\text{BeF}_2\text{-LiF}$)
 chemistry of molten, 97

M

Magnesium
 use of cut-crown for reducing UF_4 to U,
 55
 Metals
 solubility in liquid Zn, 222
 Mixer-settlers
 operation for dilute Thorex process, 198-
 99

Molten-salt fluoride-volatility processes,
 93-97
 Molybdenum alloys (Mo-U)
 decomposition in alkaline melts, 196
 Molybdenum fluorides (MoF_6)
 thermodynamic properties, 213

N

National Reactor Testing Station
 Idaho Nuclear Corporation selected as
 operator, 186
 Neptunium-237
 recovery by solvent extraction, 149
 value in spent power-reactor fuels, 3
 Neptunium fluorides (NpF_3)
 formation of complexes with CsF and
 RbF, 213
 Niobium fluorides (NbF_3)
 preparation, 93
 Niobium fluorides (NbF_5)
 preparation and properties, 93
 Nitrofluor process, 202
 Nonaqueous processing, 24-49, 84-107,
 157-75, 202-22
 Nuclear Fuels Services, Inc.
 startup, 185
 Nuclear industry
 attitude of public toward power installa-
 tions, 192-93
 review, 2, 68

P

Palladium
 value in spent power-reactor fuels, 3
 Patents
 AEC-owned made available for licensing,
 14
 announcement in press releases, 145
 availability, 193
 German, combining aqueous solvent ex-
 traction and fluoride-volatility steps,
 13-14
 pyrochemical processes, 38
 Plutonium
 commercial fuel aspects, conference on,
 138-39, 189-91
 economics, 143-45
 electrowinning from PuCl_3 , 105
 fabricating facilities, 189-91
 formation of fluoride complexes, 160-61
 measurement, evaluation of methods, 139
 preparation, 179-80, 240-41
 preparation by PuO_2 electroreduction
 in fluoride melts, 239-40
 preparation by PuO_2 reduction with Al in
 $\text{CaCl}_2\text{-CaF}_2$ flux, 104-5
 preparation by PuO_2 reduction with Ca, 57
 preparation by PuO_2 reduction with liq-
 uid Mg-Zn alloy in alkali fluxes, 127
 preparation from $\text{PuCl}_3\text{-BaCl}_2\text{-KCl}$ melts
 by electroreduction, 127-28
 preparation of high-purity by electrore-
 fining, 57, 167
 preparation of high-purity by zone melt-
 ing and electrodiffusion, 104
 purchase by Euratom, 1
 recovery from graphite molds by acid
 leaching, 128
 recovery from nitrate solutions by ion
 exchange, 74-75
 recovery from nitrate solutions by pre-
 cipitation as PuF_3 , 179

- recovery from UO_2 fuel by fluid-bed fluoride-volatility, 27-28
 - reduction of $Pu(VI)$ to $Pu(IV)$ by $U(IV)$, 17-18, 179
 - sale to Euratom by AEC, 1
 - separation from fuel solutions by solvent extraction, 18-19
 - separation from U by fluoride-volatility, 28-29
 - use in power reactors, conference on, 189-91
 - use in power reactors, review by IAEA, 187
 - Plutonium-238
 - use as heat sources, 3
 - value in spent power-reactor fuels, 3
 - Plutonium-239
 - value in spent power-reactor fuels, 3
 - Plutonium-240
 - value in spent power-reactor fuels, 3
 - Plutonium-241
 - value in spent power-reactor fuels, 3
 - Plutonium-242
 - value in spent power-reactor fuels, 3
 - Plutonium alloys (Ga-Pu)
 - electrorefining for preparation of high-purity Pu , 57
 - Plutonium alloys (Fe-Pu)
 - electrorefining for preparation of high-purity Pu , 57
 - Plutonium carbides (PuC)
 - preparation by molten-salt process, 58
 - Plutonium carbides [(U,Pu)C]
 - fuel cycle economics, 59-60
 - preparation and properties, 57-60, 180-82
 - Plutonium chlorides ($PuCl_3$)
 - electrowinning of Pu from, 105
 - production from PuO_2 , 179-80
 - production from PuO_2 , 240-41
 - Plutonium fluorides
 - decomposition by alpha and gamma radiation, 31
 - Plutonium fluorides (PuF_4)
 - conversion to oxides in fused-salt media, 165-66
 - production from PuO_2 , 241
 - Plutonium fluorides (PuF_6)
 - conversion to oxides in fused-salt media, 165-66
 - filtration of hydrolyzed, factors affecting, 29-30
 - hydrolysis apparatus, 30
 - recovery from molten salts, 96-97
 - separation from UF_6 , use of SO_2 and Freons for, 88-89
 - Plutonium nitrides (PuN)
 - preparation and properties, 60-61, 130
 - Plutonium oxides (PuO_2-UO_2)
 - economics, 67
 - Plutonium oxides [(Pu,U) O_2]
 - preparation and properties, 126-27, 182-83
 - Plutonium oxides [(U,Pu)(O,C)]
 - preparation and properties, 182-83
 - Plutonium oxides [(U,Pu)(O,C,N)]
 - preparation and properties, 182-83
 - Plutonium oxides [(U,Pu)(O,N)]
 - preparation and properties, 182-83
 - Plutonium oxides (PuO_2)
 - conversion to Pu metal, 179-80
 - fabrication for Euratom, 1
 - preparation by calcining plutonium oxalate, nitrate, hydroxide, and peroxide, late, nitrate, hydroxide and peroxide, density and sinterability of, 56
 - preparation and properties, 126-27
 - preparation from PuF_4 and PuF_6 , 165-66
 - preparation of spheres by the sol-gel process, 127
 - Plutonium phosphide (PuP)
 - preparation and properties, 62
 - Plutonium sulfide (PuS)
 - preparation and properties, 61
 - Power reactors
 - (see Reactors (power))
 - Precipitation
 - cesium-137 recovery from Purex wastes by, 48-49
 - separation of Th and U from HNO_3 solutions by, 198
 - strontium-90 recovery from Purex wastes by, 46-47
 - Press releases
 - patent announcement in, 145
 - Promethium
 - recovery from waste solutions by solvent extraction, 117-18
 - Promethium-147
 - encapsulation plant, plans for, 186
 - price decrease, 65
 - production by FPCE, 65
 - recovery from waste solutions by ion exchange, 47
 - removal from nuclear wastes, 173
 - value in spent power-reactor fuels, 3
 - Protactinium
 - formation of fluoride complexes, 161
 - Protactinium-233
 - separation from irradiated Th by coprecipitation with MnO_2 , 71
 - Public
 - attitude towards nuclear power installations, 192-93
 - Purex process
 - flow sheet, modification using $U(IV)$ for Pu reduction, 17-18
 - Purex wastes
 - cesium recovery by precipitation, 48-49
 - cesium-137 recovery by solvent extraction, 48
 - conversion to glasses, 43-44, 114
 - filtration, 41
 - incorporation in glasses, 114
 - ion-exchange treatment, 41
 - ruthenium recovery by solvent extraction, 118
 - steam stripping for removal of ammonium ion and organic matter, 41
 - strontium recovery by solvent extraction and precipitation, 46-47
 - Pyrochemical processes, 32-38, 97-105, 164-68, 216-22
- R
- Radioactive waste
 - (see Waste processing and disposal)
 - Rare-Earth Information Center
 - establishment at Ames Laboratory, 139-40
 - Rare earths
 - information center established at Ames Laboratory, 139-40
 - recovery from Darex wastes by solvent extraction, 118
 - removal from wastes by ion exchange, 225-26
 - Reactors (APPR)
 - fuel dissolution, ICPP electrolytic, 22
 - Reactors (BR-3)
 - fuel processing by Eurochemic, 1
 - Reactors (converters)
 - fuel-processing costs for advanced type, 3-7
 - Reactors (Dresden Power)
 - purchase of core for reloading, 185
 - Reactors (EDF)
 - fuel-processing-plant startup, 185
 - Reactors (EDF-1)
 - fuel processing by Eurochemic, 1
 - Reactors (EL-1)
 - fuel processing by Eurochemic, 1
 - Reactors (EL-2)
 - fuel processing by Eurochemic, 1
 - Reactors (EL-3)
 - fuel processing by Eurochemic, 1
 - Reactors (fast)
 - fuel processing by salt-transport process, 164-65
 - Reactors (HTGCR)
 - fuel dissolution, 194-95
 - Reactors (HTRE)
 - fuel dissolution, ICPP electrolytic, 22
 - Reactors (KRB)
 - fueling arrangements, 138
 - Reactors (LMFBR)
 - program office established at ANL, 187
 - Reactors (MSBR)
 - fuel processing by fluoride-volatility and salt-distillation techniques, 161-64, 213-16
 - fuel processing by pyrochemical techniques, 221-22
 - Reactors (NOK)
 - fueling arrangements, 138
 - Reactors (NUCLENOR)
 - fueling arrangements, 138
 - Reactors (PM-3A)
 - fuel dissolution, ICPP electrolytic, 22
 - Reactors (Peach Bottom Power)
 - fuel processing by fluoride-volatility processes, 84-85, 203-5
 - fuel processing by pressurized aqueous combustion, 69-70
 - Reactors (power)
 - community attitude towards, 192-93
 - foreign development, 191-92
 - fuel processing by fluoride-volatility processes, 84
 - indemnity regulations, amendments to, 139
 - orders for 1965, 139
 - use of Pu fuel, conference on, 189-91
 - use of Pu fuel, review by IAEA, 187
 - values of fission products and heavy elements in spent fuel, 3
 - Reactors (Rover)
 - fuel processing by fluoride-volatility method, 203-5
 - Reactors (VEW)
 - fueling arrangements, 138
 - Reactors (ZORITA)
 - fueling arrangements, 138
 - Redox wastes
 - cesium-137 recovery from by ion exchange, 47-48
 - Regulations
 - amendments to fissionable-material accountability, 186-87
 - state authority over radioactive materials, 187
 - Remote-systems technology, 105-7
 - conference on, 105-7
 - Reviews
 - nuclear industry, 2, 68
 - Rhodium
 - value in spent power-reactor fuels, 3
 - Ruthenium
 - decontamination in solvent-extraction processes, 72-73
 - recovery from Purex wastes by solvent extraction, 118

- removal by solvent extraction, 197
- removal from wastes by electro dialysis and electrodeionization, 170-71
- value in spent power-reactor fuels, 3
- Ruthenium fluorides (RuF_3)
 - enthalpy of formation, 93
- S**
- Safety**
 - thermal behavior of anion-exchange resins in nitric acid systems, 131-34
- Salt**
 - production and recovery of transplutonic elements from nuclear explosions in, 151
- Salt-cycle process**, 36, 101
- Salt-metal process**, 34-35
 - corrosion of construction materials, 34
- Salt mines**
 - storage of calcined wastes in, 233-34
- Salt-transport process**, 97-100, 164-65, 217-19
 - corrosion of materials in, 100, 219-21
- Sampling**
 - remote system for process streams at Eurochemic, 153-54
- SAP (sintered aluminum products)**
 - dissolution in mercury-catalyzed H_2SO_4 , 15
- Savannah River Plant**
 - processing of spent fuel from French reactors, 1
 - waste management, 174
 - waste storage, computer program for inventory and control, 118
 - waste-storage-tank leaks, 174
- Selenium fluorides (SeF_6)**
 - thermodynamic properties, 213
- Shale**
 - injection of wastes into by hydraulic fracturing, 116-17
- Shear-leach process**
 - for UO_2 and UO_2-ThO_2 stainless-steel-clad fuels, 78-81
- Shipping**
 - spent fuel, economics, 10-13
 - spent fuel, symposium, 13
- Shipping casks**
 - design, 11
- Sol-gel process**, 122-26, 177
- Solvent-extraction processes**, 17-21, 72-74, 149-51, 196-97
 - (see also specific materials recovered by)
 - flooded equations for pulse columns, 199-200
 - waste-processing applications, 46-49, 117-18, 173-74
- Spain**
 - barter proposal, natural U for enriched U, AEC approval, 138
- Spinoff**
 - program at ANL, 187
- SRP**
 - (see Savannah River Plant)
- Stainless steel**
 - dissolution, 25-27, 70, 202, 206-7
- States**
 - regulatory authority over the use of radioactive material, 187
- Storage tanks**
 - economics for perpetual storage of high-level wastes, 44-46
 - leaks at SRP, 174
- Strontium**
 - recovery from Drexel wastes by solvent extraction, 118
- recovery from TBP-25 process wastes**
 - by solvent extraction, 118
 - removal from wastes by ion exchange, 170, 225-26
- Strontium-90**
 - encapsulation plant, plans for, 186
 - price decrease, 65
 - production by FPCE, 65
 - recovery from Purex wastes by precipitation, 46-47
 - recovery from Purex wastes by solvent extraction, 46
 - removal from fuel-storage-basin water by ion exchange, 40-41
 - value in spent power-reactor fuels, 3
- Sulfur fluorides (SF_6)**
 - thermodynamic properties, 213
- Sulfuric acid**
 - dissolution of SAP by mercury catalyzed, 16
 - dissolution of stainless steel, 70
 - uranium-ore leaching, 51-52
- Switzerland**
 - barter proposal, natural U for enriched U, AEC approval, 138
- Symposia**
 - (see Conferences and symposia)
- T**
- TBP-25 process wastes**
 - recovery of Cs and Sr from, 118
- Technetium-99**
 - value in spent power-reactor fuels, 3
- Tellurium fluorides (TeF_6)**
 - thermodynamic properties, 213
- Thallium fluoride (TlF)**
 - enthalpy of formation, 93
 - vapor pressure from 420-820°C, 93
- Thorex process**
 - mixer-settler operation, 198-99
- Thorium**
 - separation from fission products by chromatography, 198
 - separation from HNO_3 by precipitation, 198
 - separation from U by ion exchange, 153
- Thorium carbides (ThC)**
 - preparation by the sol-gel process, 122-25
- Thorium carbides (ThC_2)**
 - preparation by the sol-gel process, 125-26
 - preparation from ThO_2 or $(Th,U)O_2$, 126
- Thorium carbides (ThC_2-UC_2)**
 - phase diagrams, 126
- Thorium carbides $[Th,U]C$**
 - preparation by the sol-gel process, 122-25
- Thorium carbides $[(Th,U)C_2]$**
 - coating of particles with C films, 126
 - preparation by the sol-gel process, 125-26
- Thorium nitrates $[Th(NO_3)_4-UO_2(NO_3)_2]$**
 - processing by freezing, 198
- Thorium oxides (ThO_2)**
 - production by precipitation and calcination of $Th(C_2O_4)_2$, 242
 - production of spherical particles by a d-c arc plasma generator, 242
 - production of spheres by the sol-gel process, 122-25, 241-42
- Thorium oxides $[(Th,U)O_2]$**
 - preparation by the sol-gel process, 122-25
- Thorium oxides (ThO_2-UO_2)**
 - dissolution in HNO_3 , 194-95
- Thorium-Uranium Recycle Facility**
 - design and operation, 78, 82
- Transplutonic elements**
 - production and recovery from nuclear detonations in salt, 150-51
- TURF**
 - (see Thorium-Uranium Recycle Facility)
- U**
- United Kingdom**
 - nuclear power development, 191-92
- Uranium**
 - commercial orders for enriched, 188
 - enrichment, review, 68
 - enrichment services and costs, 188-89
 - market forecast, 187-88
 - measurement, evaluation of methods, 139
 - precipitation from HNO_3 , 198
 - preparation from UF_4 by reduction with cut-crown Mg, 55
 - preparation from UO_2 by electrolytic reduction in chloride and fluoride melts, 55-56
 - preparation of high-purity by electrorefining, 167
 - recovery from ores, 51-52, 237-38
 - separation from fission products by chromatography, 198
 - separation from Pu by fluoride-volatility, 28-29
 - separation from Th by ion exchange, 153
 - separation from Y by ion exchange, 151-53
- Uranium-236**
 - value in spent power-reactor fuels, 3
- Uranium-238**
 - value in spent power-reactor fuels, 3
- Uranium alloys (Al-U)**
 - chloride-volatility processing, 24-25
 - fluoride-volatility processing, 202-3
 - molten-salt fluoride-volatility processing, 93-95
- Uranium alloys (Mo-U)**
 - decomposition in alkaline melts, 196
- Uranium alloys (U-Zr)**
 - chloride-volatility processing, 24-25
 - dissolution, 70-71
 - dissolution in ICP electrolytic process, 147-49
 - fluoride-volatility processing, 157, 202-3
 - processing by Nitrofluor process, 202
- Uranium carbides (UC)**
 - preparation by carbothermic reduction of UO_2 and U_3O_8 , 57-58
 - preparation by fluid-bed process, 58
 - preparation by liquid-metal process, 58
 - preparation by molten-salt process, 58
 - processing by CARBOX process, 36-37
 - processing by fluoride-volatility methods, 157
 - processing by fused-salt electrolysis, 37
 - processing by nitride-carbide cycle, 37
- Uranium carbides (UC-graphite)**
 - processing by burning, leaching and solvent extraction, 196
 - processing by fluoride-volatility methods, 84-86, 203-5
- Uranium carbides (UC_2)**
 - preparation by carbothermic reduction of UO_2 , 57-58
- Uranium carbides $[Pu,U]C$**
 - fuel-cycle economics, 59-60
 - preparation and properties, 57-60, 180-82
 - preparation by liquid-metal process, 58

- Uranium carbides [(Th,U)C]
preparation by the sol-gel process, 122-25
- Uranium carbides [(Th,U)C₂]
coating of particles with C films, 126
preparation by the sol-gel process, 125-26
- Uranium carbides (ThC₂-UC₂)
phase diagrams, 126
- Uranium concentrates
(see also Uranium oxides (U₃O₈))
preparation, 237
preparation from ores by H₂SO₄ leaching, 51-52
purchase contract, 138
- Uranium fluorides (UF₃)
formation of complexes with KF, RbF, and CsF, 213
- Uranium fluorides (UF₄)
conversion to UO₂ in fused-salt media, 165-66
reduction to U by cut-crown Mg, 55
- Uranium fluorides (UF₆)
conversion to UO₂, 122, 165-66
conversion to U₃O₈, 52-54
decontamination by absorption-desorption cycle in bed of NaF pellets, 91-92, 160, 212-13
market potential, 65
prices, 65
production by Allied Chemical Corp., 65
recovery from molten salts, 96-97
separation from PuF₆, use of SO₂ and Freons for, 88-89
specifications, 66
- Uranium nitrides (UN)
preparation and properties, 59-60
preparation from UO₂, 128-30
- Uranium ores
processing, 237-38
uranium extraction by H₂SO₄ leaching, 51-52
- Uranium oxides (UO₂)
coating of particles with Ni, 177-78
conversion to U₃O₈ for fluoride-volatility processing, 208
fluorination with BrF₃, 210-11
fluorination with ClF₃, 209-10
oxidation, kinetics of, 178
preparation and properties, 177-78
preparation from UF₄, 165-66
preparation from UF₆, 122, 165-66
preparation from UO₃ and U₃O₈ by C reduction, kinetics of, 121
preparation by UO₃ reduction with carbon, 121
preparation of spherical particles by the sol-gel process, 177
preparation of spherical particles from UF₆, 52-53
processing by AIROX process, 36
processing by chloride-volatility processes, 86
processing by fluoride-volatility processes, 27-28, 86-90, 157-60, 206
processing by pyrochemical techniques, 222
processing by solvent extraction and fluoride-volatility methods, 25
sinterability, 178-79
volatility, 178
- Uranium oxides (UO₂)(stainless-steel clad)
processing by shear-leach process, 78-81
- Uranium oxides (UO₂)(Zircaloy-2 clad)
waste management for fluoride-volatility processing, 211-12
- Uranium oxides (UO₃)
production from uranyl nitrate, 52
- Uranium oxides (U₃O₈)
fluorination with BrF₃, 90-91
preparation by dissociation of gamma UO₃ in vacuum, 121
preparation from UF₆, 52-54
purchase by AEC, 138
- Uranium oxides [(Pu,U)O₂]
preparation and properties, 126-27
- Uranium oxides [(Pu,U)(O,C)]
preparation and properties, 182-83
- Uranium oxides [(Pu,U)(O,C,N)]
preparation and properties, 182-83
- Uranium oxides [(Pu,U)(O,N)]
preparation and properties, 182-83
- Uranium oxides (PuO₂-UO₂)
economics, 67
fluoride-volatility processing, 208-9
- Uranium oxides [(Th,U)O₂]
preparation by the sol-gel process, 122-25
- Uranium oxides (ThO₂-UO₂)(stainless-steel clad)
dissolution in HNO₃, 194-95
processing by shear-leach process, 78-81
- Uranium oxides (ThO₂-U₃O₈)
fluoride-volatility processing, 84-85
- Uranium oxides (UO₂-UO₃)
phase diagrams, 121-22
- Uranium phosphide (UP)
preparation and properties, 62
- Uranium powder
production from UO₃ by reduction with Ca or CaH₂, 54-55
- Uranium sulfide (US)
preparation and properties, 61-62
- Uranyl nitrate
conversion to UO₃, 52
electrolytic reduction, 179
- Uranyl nitrates [(Th(NO₃)₄-UO₂(NO₃)₂)]
processing by freezing, 198
- v
- Volatility processes, 24-32, 84-96, 157-64, 202-16
- w
- Waste Processing and Disposal
burial site for low-level in Ill., 65
burial site proposed at Hanford, 2
calcination, 42-44, 112-15, 119, 171-73, 227-34
crystallization process, 118-19
electrodeionization applications, 170-71, 226-27
electrodialysis applications, 170-71, 226-27
evaporation, 118
evaporation using solar energy, 234
fission-product recovery, 1-2, 46-49, 117-18, 173-74, 234
- fission-product recovery and encapsulation, plant for, 1-2, 65, 186
for fluoride-volatility processes, 211-12
freeze-drying process, 42
hydraulic fracturing into shale, 116-17
incorporation in asphalt, 111-12, 170-71, 227
incineration of solid wastes, 234-35
incorporation in glasses, 43-44, 73, 113-15, 172-73, 175, 228-33
in-tank solidification, 115-16, 233
ion-exchange applications, 40-42, 47-48, 110-11, 170, 225-26, 234
management at Savannah River, 174
management, reviews, 118
review, 68, 234
scavenging-precipitation foam separation treatment at ORNL, 119
scavenging-precipitation ion-exchange treatment at ORNL, 119
storage, economics of, 44-46, 143
storage of high-level, perpetual, 44-46
storage at Savannah River, computer program for inventory and control, 118
storage of calcined solids in salt mines, 233-34
storage-tank leaks at Savannah River, 174
- Water
decontamination by ion exchange, 40-41, 110-11
reaction with ClF₃, 161
- Weldon Spring Plant
availability to industry, 186
- West Germany
barter proposal, natural U for enriched U, AEC approval, 138
- x
- Xenon
value in spent power-reactor fuels, 3
- y
- Yttrium
removal from wastes by ion exchange, 225-26
separation from U by ion exchange, 151-53
- Yttrium fluorides (YF₃)
enthalpy of formation, 93
- z
- Zinc
solubilities of various metals in liquid, 222
- Zircaloy
dissolution in NH₄F-citric acid, 195-96
- Zirconium alloys (U-Zr)
chloride-volatility processing, 24-25
fluoride-volatility processing, 157, 202-3
processing by Nitrofluor process, 202
- Zirconium fluorides (ZrF₄)
purification by sublimation techniques, 93

